AS ENERGI

Thyristor
AGF 3000-45-J-02

Key Parameters

V_{DRM}	=	4500	V
I_{TGQM}	=	3000	A
I_{TSM}	=	24	kA
V_{T0}	=	1.8	V
r_T	=	0.7	mΩ
V_{Dclink}	=	3000	V

Features

- Patented free-floating silicon technology
- Low on-state and switching losses
- Annular gate electrode
- Industry standard housing
- Cosmic radiation withstand rating

Blocking

Symbols and parameters			Value			Unit
			min	typ	max	
V_{DRM}	Repetitive peak off-state voltage	$V_{GR} \geq 2$ V			4500	V
V_{RRM}	Repetitive peak reverse voltage				17	V
$V_{DC\text{-}link}$	Permanent DC voltage for 100 FIT failure rate	-40 ≤ T_j ≤ 125 °C. Ambient cosmic radiation at sea level in open air.			3000	V
I_{DRM}	Repetitive peak off-state current	$V_D = V_{DRM}$, $V_{GR} \geq 2$ V			100	mA
I_{RRM}	Repetitive peak reverse current	$V_R = V_{RRM}$, $R_{GK} = \infty$			50	mA

Mechanical data

Symbols and parameters			Value			Unit
			min	typ	max	
F_m	Mounting force		28		38	kN
A	Acceleration: Device unclamped Device clamped				 50 200	m/s^2
m	Weight				1.3	kg
D_s	Surface creepage distance		33			mm
D_a	Air strike distance		15			mm

GTO Data

Symbols and parameters				Value			Unit
				min	typ	max	
$I_{T(AV)M}$	Max. average on-state current	Half sine wave, T_C = 85 °C				960	A
$I_{T(RMS)}$	Max. RMS on-state current					1510	kA
I_{TSM}	Max. peak non-repetitive surge current	t_P = 10 ms t_P = 1 ms	T_j = 125 °C After surge: $V_D = V_R$ = 0V			24 40	kA
I^2t	Limiting load integral	t_P = 10 ms t_P = 1 ms				2.88×10^6 0.80×10^6	A^2s
V_T	On-state voltage	I_T = 3000 A				3.9	V
$V_{(T0)}$	Threshold voltage	I_T= 400-4000 A	T_j = 125 °C			1.8	V
r_T	Slope resistance					0.7	mΩ
I_H	Holding current	T_j = 25°C				100	A

Turn-on switching

Symbols and parameters				Value			Unit
				min	typ	max	
di_T/dt_{cr}	Max. rate of rise of on-state current	I_T = 3000 A, T_j = 125 °C I_{GM} = 25 A, di_G/dt = 20 A/µs	f = 200 Hz			500	A/µs
			f = 1 Hz			1000	A/µs
$t_{on(min)}$	Min. on-time	V_D = 0.5 V_{DRM}, T_{vj}=125 °C I_T = 3000 A, di/dt = 300 A/µs, I_{GM} = 25 A, di_G/dt = 20 A/µs, C_S = 3 µF, R_S = 5 Ω		100			µs
t_d	Delay time					2.5	µs
t_r	Rise time					5.0	µs
E_{on}	Turn-on energy per puls					2.5	Ws

Turn-off switching

Symbols and parameters			Value			Unit
			min	typ	max	
I_{TGQM}	Max. controllable turn-off current	$V_{DM} = V_{DRM}$, $di_{GQ}/dt = 40$ A/µs $C_S = 3$ µF, $L_S \leq 0.2$ µH			3000	A
t_{off}	Min. off-time	$V_D = 0.5\ V_{DRM}$, $T_{vj} = 125$ °C $V_{DM} = V_{DRM}$, $di_{GQ}/dt = 40$ A/µs, $I_{TGQ} = I_{TGQM}$, $R_S = 3\ \Omega$, $C_S = 5$ µF, $L_S \leq 0.2$ µH	100			µs
t_S	Storage time				25	µs
t_f	Fall time				3	µs
E_{off}	Turn-on energy per pulse				10	Ws
I_{GQM}	Peak turn-off gate current				800	A

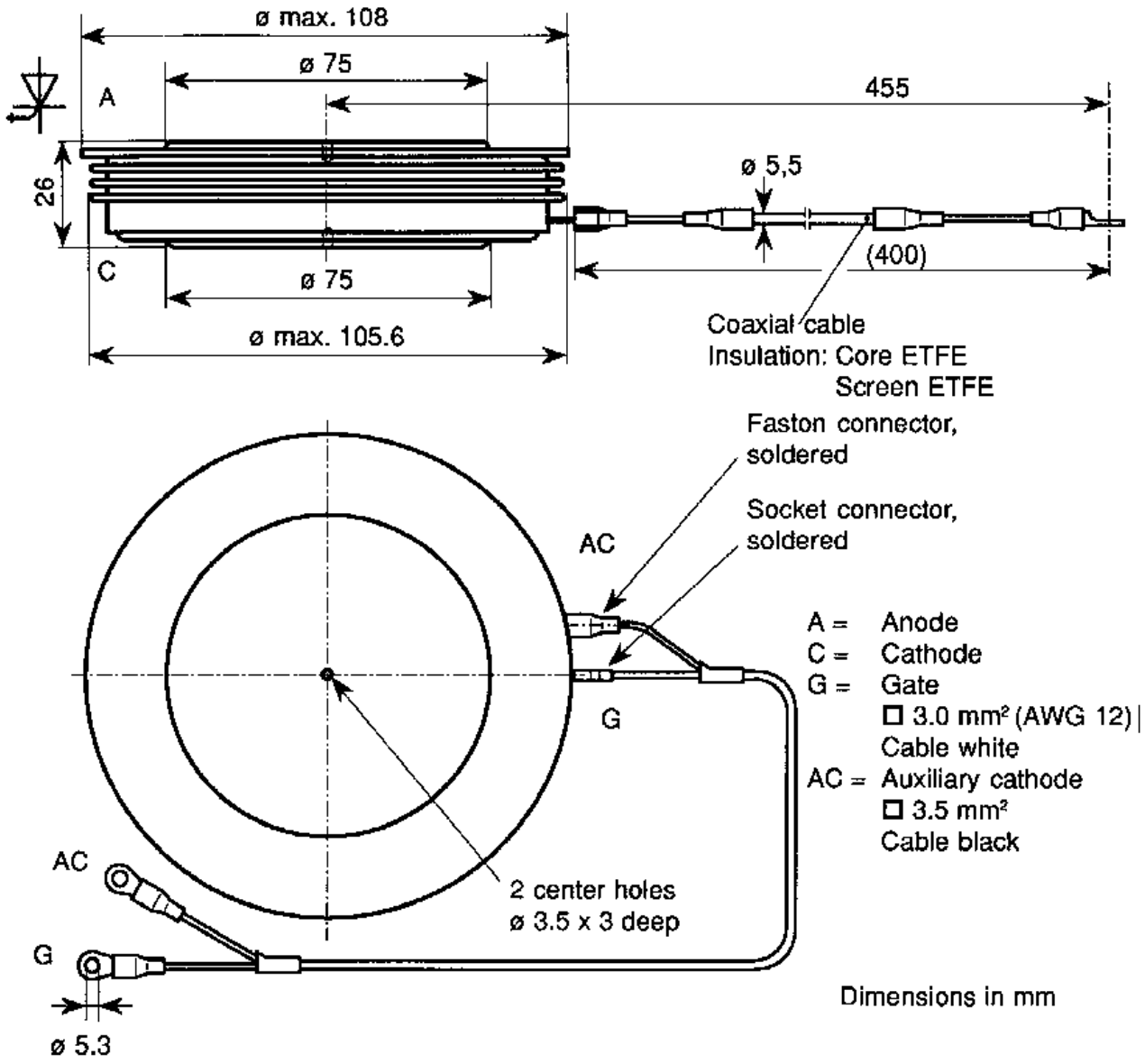
Gate

Symbols and parameters			Value			Unit
			min	typ	max	
V_{GRM}	Repetitive peak reverse voltage				17	V
I_{GRM}	Repetitive peak reverse current	$V_{GR} = V_{GRM}$			20	mA
V_{GT}	Gate trigger voltage	$T_{vj} = 25$°C, $V_D = 24$ V, $R_A = 0.1\ \Omega$		1.2		V
I_{GT}	Gate trigger current			2.5		A

Thermal

Symbols and parameters			Value	Unit
T_j	Junction operating temperature		-40 ... 125	°C
R_{thJC}	Thermal resistance junction to case	Anode side cooled	22	K/kW
		Cathode side cooled	27	K/kW
		Double side cooled	12	K/kW
R_{thCH}	Thermal resistance case to heatsink (Double side cooled)	Single side cooled	6	K/kW
		Double side cooled	3	K/kW

DIMENSIONS


ø max. 108
ø 75
A
455
26
ø 5,5
C
ø 75
(400)
ø max. 105.6
Coaxial cable
Insulation: Core ETFE
Screen ETFE
Faston connector, soldered
Socket connector, soldered
AC
A = Anode
C = Cathode
G = Gate
□ 3.0 mm² (AWG 12)
Cable white
AC = Auxiliary cathode
□ 3.5 mm²
Cable black
G
2 center holes
ø 3.5 x 3 deep
AC
G
ø 5.3
Dimensions in mm

Analytical function for transient thermal impedance:

$$Z_{thJC}(t) = \sum_{i=1}^{4} R_i(1 - e^{-t/\tau_i})$$

i	1	2	3	4
R_i (K/kW)	5.4	4.5	1.7	0.4
τ_i (s)	1.2	0.17	0.01	0.001

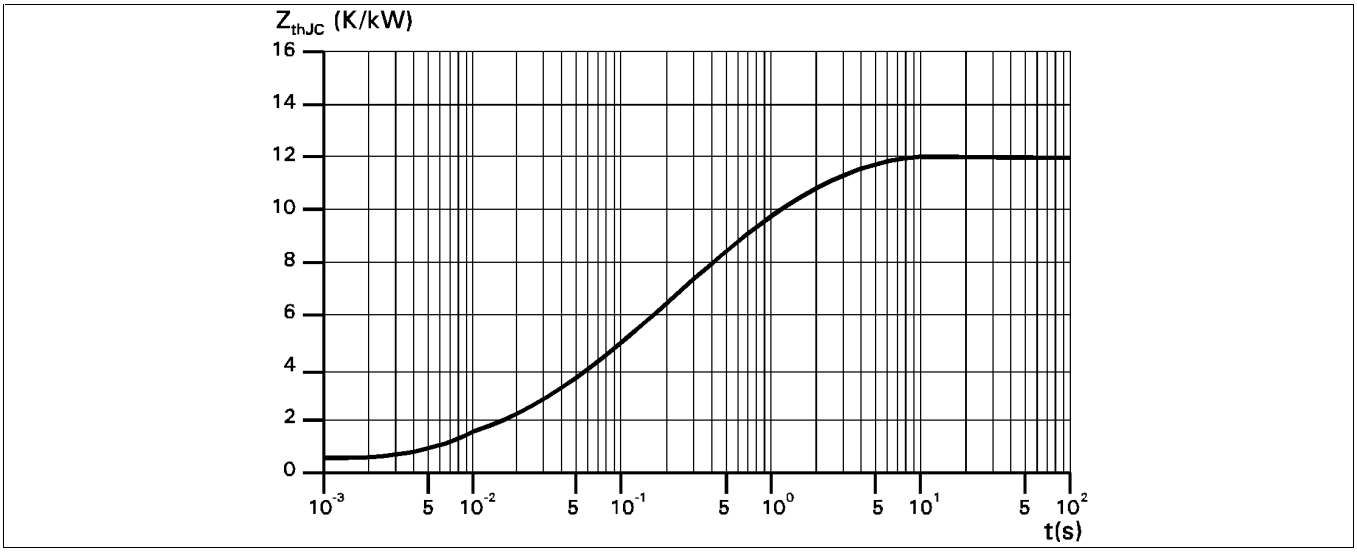


Fig. 1 Transient thermal impedance, junction to case.

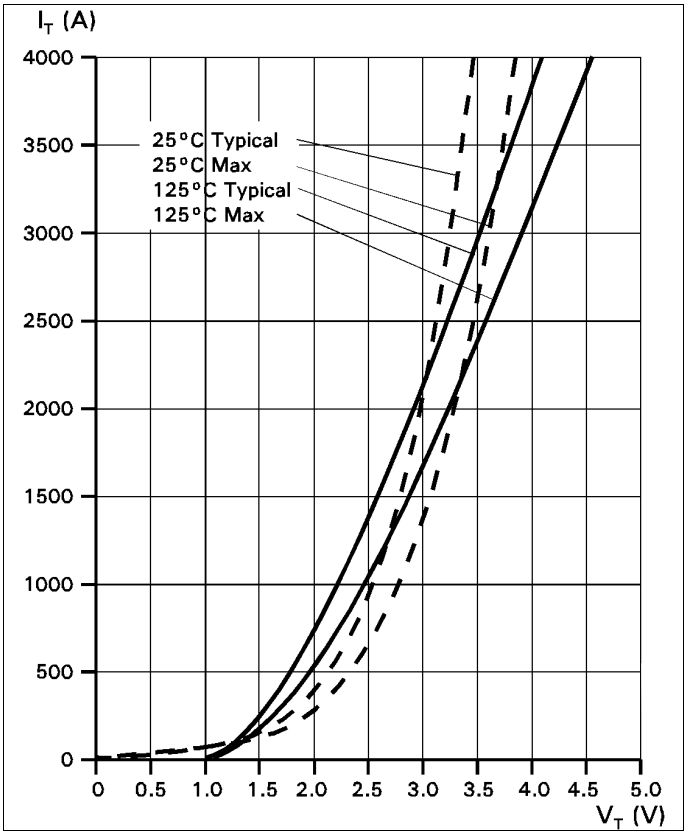


Fig. 2 On-state characteristics

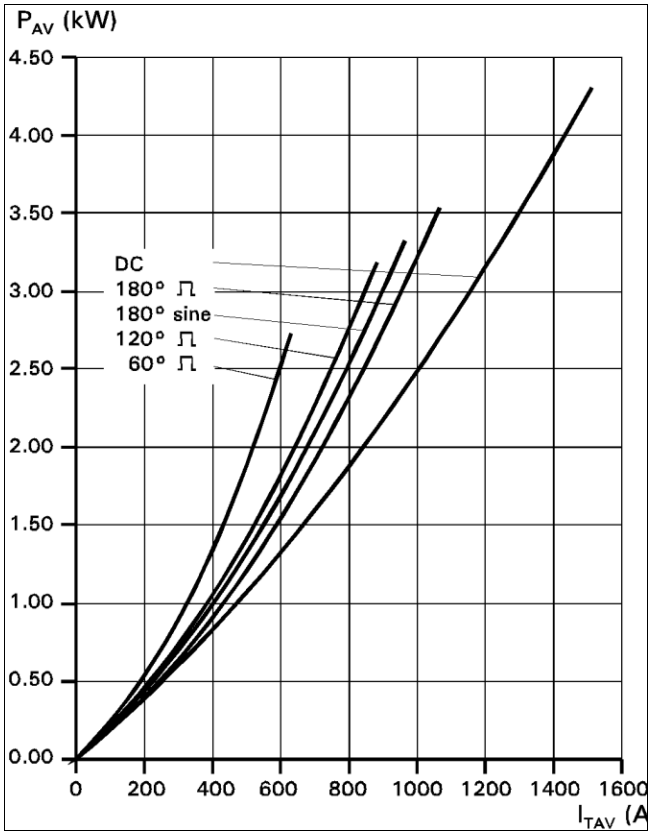


Fig. 3 Average on-state power dissipation vs. average on-state current.

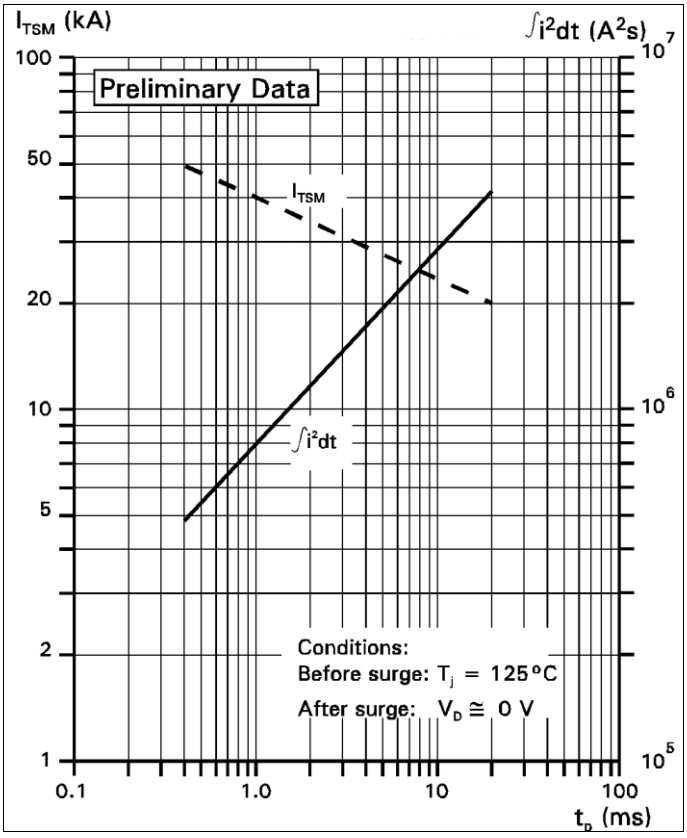


Fig. 4 Surge current and fusing integral vs. pulse width

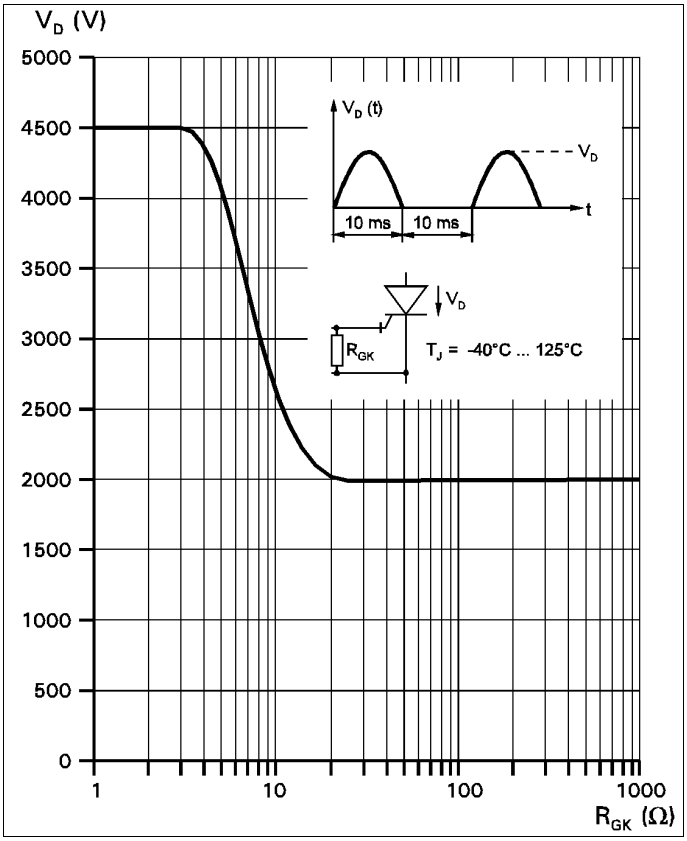


Fig. 5 Forward blocking voltage vs. gate-cathode resistance.

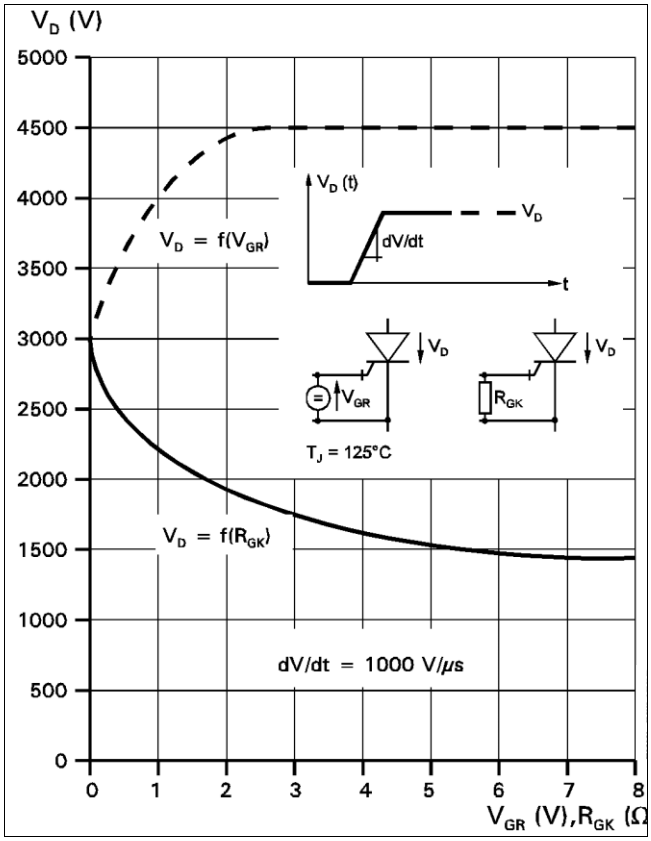


Fig. 6 Static dv/dt capability: Forward blocking voltage vs. neg. gate voltage or gate cathode resistance.

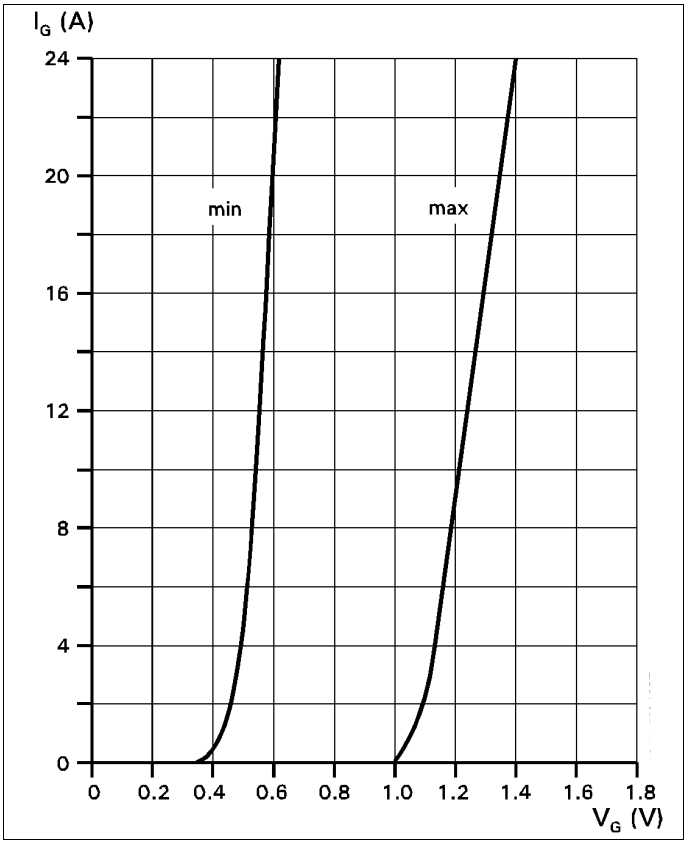


Fig. 7 Forwarde gate current vs. forard gate voltage.

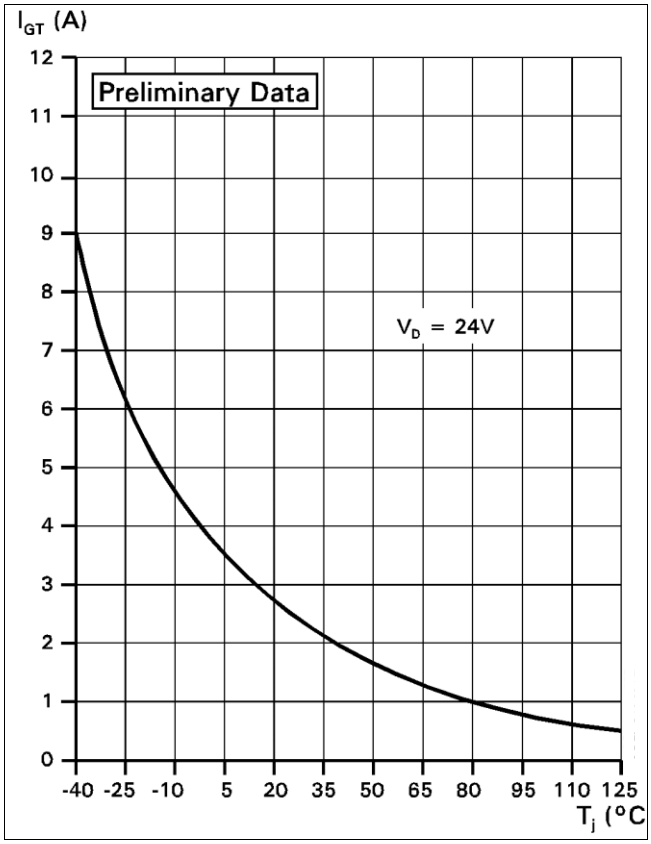


Fig. 8 Gate trigger current vs. junction temperature

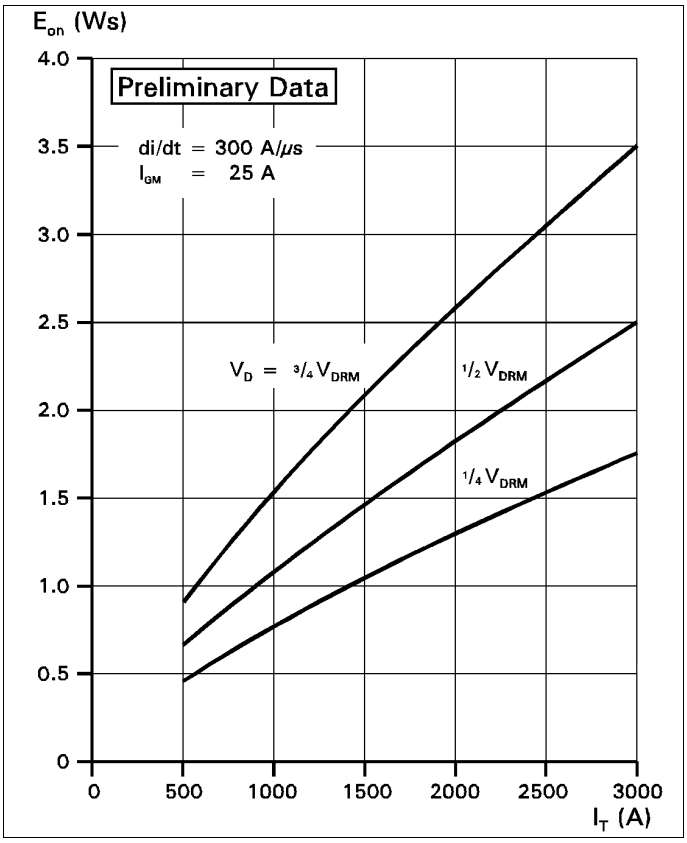


Fig. 9 Turn-on energy per pulse vs. on-state current and turn-on voltage.

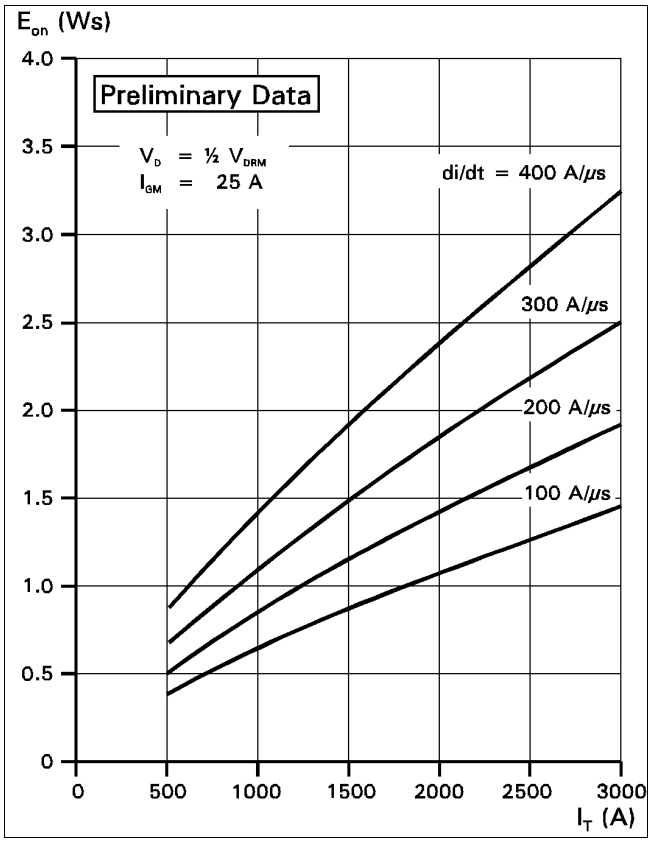


Fig. 10 Turn-on energy per pulse vs. on.-state current and current rise rate

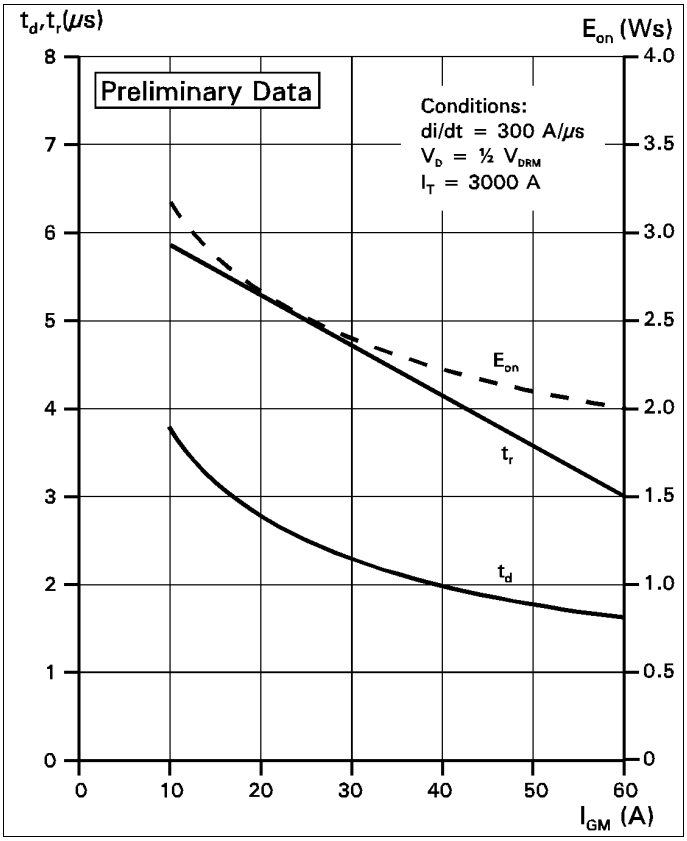


Fig. 11 Turn-on energy per pulse vs. on-state current and turn-on voltage.

Common Test conditions for figures 9, 10 and 11:

di_G/dt	= 20 A/µs
C_S	= 3 µF
R_S	= 5 Ω
Tj	= 125 °C

Definition of Turn-on energy:

$$E_{on} = \int_0^{20\,\mu s} V_D \cdot I_T dt \quad (t = 0, I_G = 0.1 \cdot I_{GM})$$

Common Test conditions for figures 12, 13 and 15:

Definition of Turn-off energy:

$$E_{off} = \int_0^{40\,\mu s} V_D \cdot I_T dt \quad (t = 0, I_T = 0.9 \cdot I_{TGQ})$$

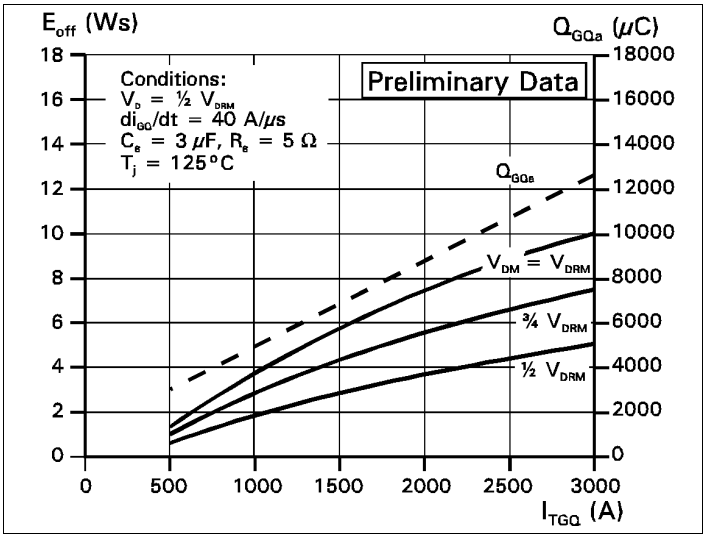


Fig. 12 Turn-off energy per pulse vs. turn-off current and peak turn-off voltage. Extracted gate charge vs. turn-off current.

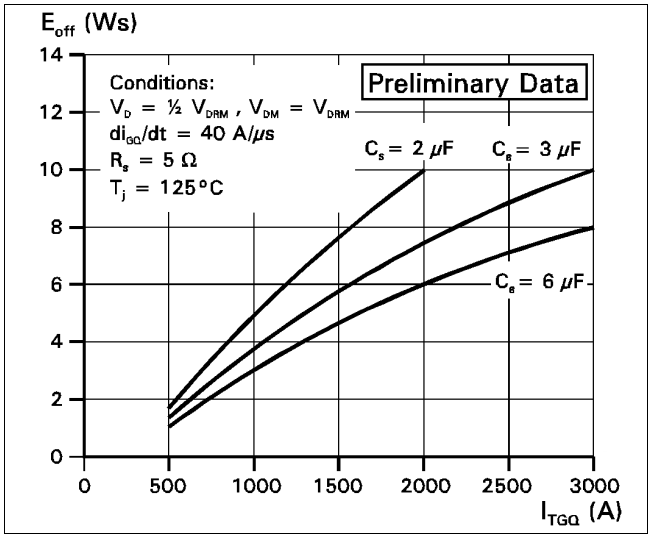


Fig. 13 Turn-off energy per pulse vs. turn-off current and snubber capacitance.

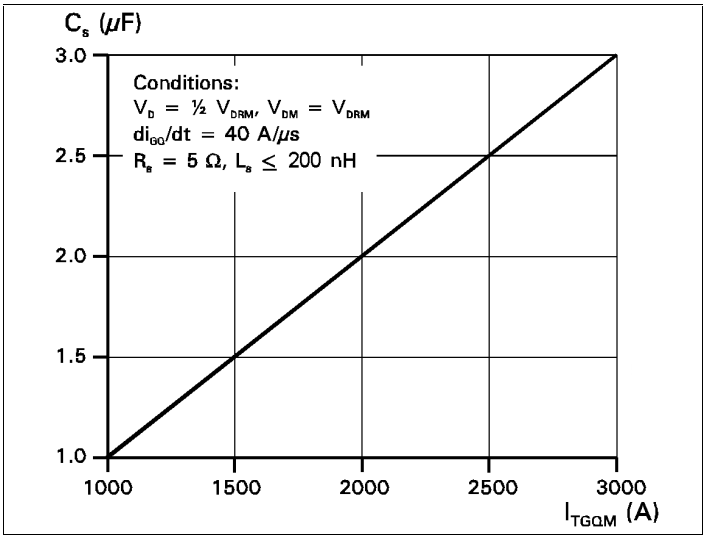


Fig. 14 Required snubber capacitor vs. max allowable turn-off current.

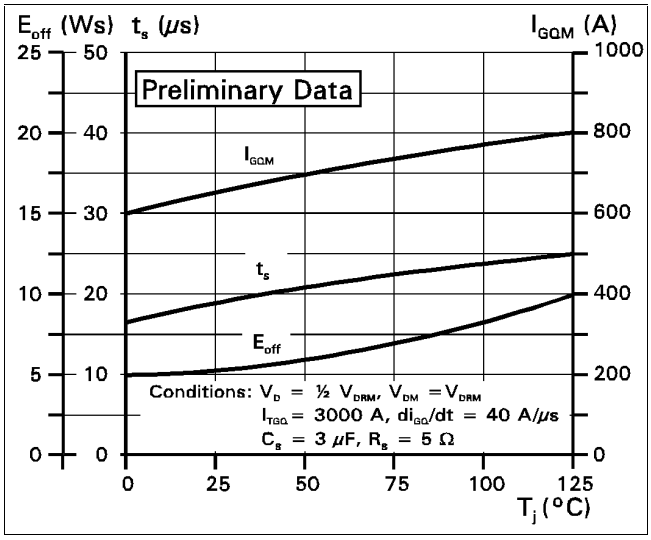


Fig. 15 Turn-off energy per pulse, storage time and peak turn-off gate current vs. junction temperature

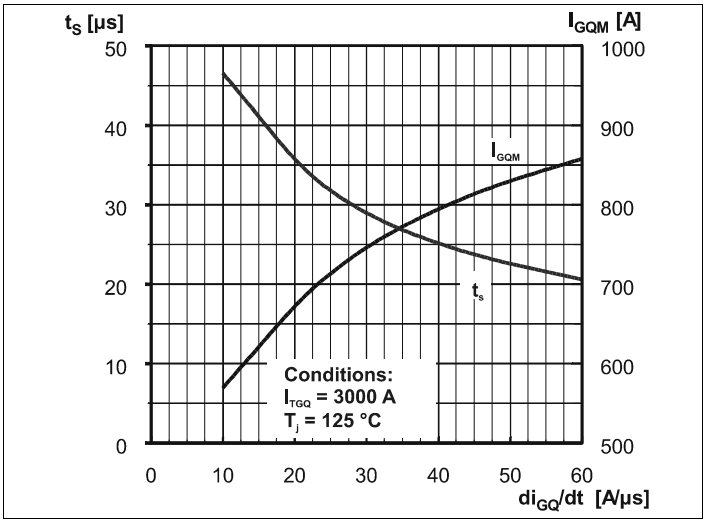


Fig. 16 Storage time and peak turn-off gate current vs. neg. gate current rise rate.

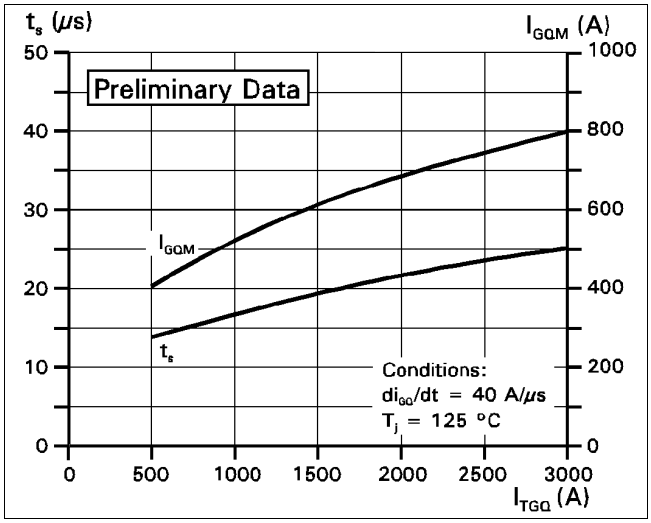


Fig. 17 Storage time and peak turn-off gate current vs. turn-off current

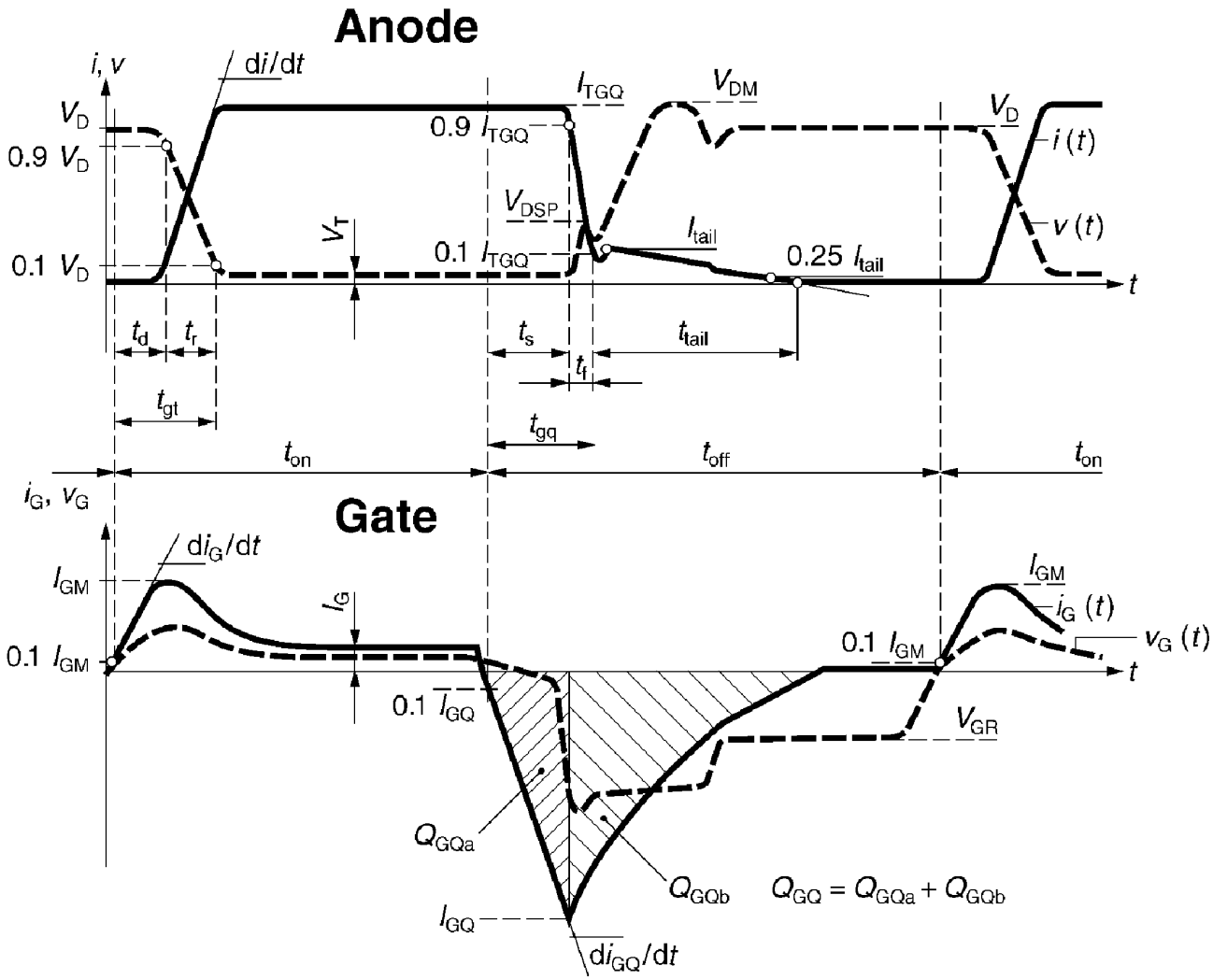


Fig. 18 General current and voltage waveforms with GTO-specific symbols